GE Nuclear Energy

General Electric Company
175 Curtner Avenue, San Jose, CA 95125

April 22, 1993

Docket No. STN 52-001

Chet Poslusny, Senior Project Manager
Standardization Project Directorate
Associate Directorate for Advanced Reactors
and License Renewal
Office of the Nuclear Reactor Regulation

Subject: Submittal Supporting Accelerated ABWR Review Schedule - **DFSER Confirmatory Item 18.4.3-1**

Dear Chet:

Enclosed is a draft of the revised Appendix 18F addressing DFSER Confirmatory Item 18.4.3-1. Tables 18F-1 through 18F-12.3 (originally Tables 18F-1 through 18F-13.3) are not included in this transmittal and are subject to a small amount of revision.

With regard to Greg Galletti's February 16, 1993 comments, we believe that the addition of the minimum inventory described in Section 18F.3 deprives the majority of those comments of significance and, therefore, we have not responded to them. Exceptions to this are those comments having to do with the PRA important operator actions. Modifications to Subsection 19D.7.6 will resolve those comments related to the PRA.

Please provide a copy of this transmittal to Clare Goodman.

Sincerely,

Jack Fox

Jack Fox
Advanced Reactor Programs

cc: Norman Fletcher (DOE)
Keith Gregoire (GE)

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APPENDIX 18F

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18F.1 INTRODUCTION

This appendix contains the results of an analysis of information and control needs of the main control room operators. The analysis is based upon the operation strategies given in the ABWR Emergency Procedure Guidelines (EPGs), as presented in Appendix 18A, and upon the significant operator actions determined by the Probabilistic Risk Assessment (PRA), given in Subsection 18F.2.4, and is composed of two parts. The first part of the analysis is presented in Section 18F.2 and supports the development of a typical inventory of controls, displays and alarms which would be used by the main control room operators to implement the ABWR EPGs and to perform the significant operator actions determined by the PRA. The results of the analysis are summarized in Tables 18F-1 through 18F-12.3 of this appendix. The inventory of controls, displays and alarms generated through the analysis described in Section 18F.2 is presented for information only, as the actual full inventory of controls, displays and alarms to be provided in a particular plant application will be developed through the human-system interface (HSI) design implementation process presented in Appendix 18E.

The second part of the analysis provides the basis for defining a minimum inventory of fixed-position controls, displays and alarms which can be used by the operators, executing the ABWR EPGs, to shut down the reactor, maintain adequate core cooling and remove core decay heat. The results of the second part of the analysis are presented in Section 18F.3 and Tables 18F-13 through 18F-24 of this appendix. This minimum inventory of fixed-position controls, displays and alarms, generated through the analysis described in Section 18F.3 and summarized in Tables 18F-22 through 18F-24, is considered to be part of the ABWR licensing basis and, therefore, as defined in Articles VI.2.c and VIII.2.h(i) of the Table 18E.2.1 definition of the HSI design implementation requirements, each ABWR design implementation will be confirmed to include that minimum set of fixed-position controls, displays and alarms.

The information and controls identified from this analysis do not necessarily include those derived from other design requirements.

18F.2 TYPICAL INVENTORY OF CONTROLS, DISPLAYS AND ALARMS

A task analysis of the ABWR EPGs and PRA important operator actions was performed and is documented in Tables 18F-1 through 18F-11. The detailed analysis method employed is best presented by describing the structure of these tables.

18F.2.1 Task Analysis Structure

In Tables 18F-1 through 18F-11, information and control needs for each operation instruction or action are presented in fourteen (14) columns of information. Information called for and presented in each of those columns in the tables is as follows:

1. STEP REFERENCE
   Reference to either the EPGs or to the PRA as the basis of the particular step addressed by the associated set of table entries.

2. STEP
Specific step in the EPGs (referred to as the EPG step) or specific operator action referenced in the PRA (herein referred to as the PRA step) or item reference in the PRA.

3. DESCRIPTION OF STEP
A summary description of the step or operator action.

4. INFORMATION TO PERFORM A STEP
Information needed by the operator to perform the specific EPG step or PRA operator action.

5. CONTROL FUNCTIONS TO PERFORM A STEP
Control functions that the operators perform to execute the action(s) specified in the EPG step or PRA operator action.

6. PARAMETER DISPLAYS TO EXECUTE STEP
Plant process parameters the status of which the operator must be aware of for execution of the step given in the EPG step or PRA operator action.

7. CONTROLS TO EXECUTE STEP
Controls necessary for the execution of the step.

8. ALARMS TO PERFORM STEP
Annunciators necessary for the execution of the step.

9. OPERATOR AIDS TO PERFORM STEP
Operator aids such as supplementary procedures or other information necessary for the execution of the step.

10. DISPLAYS TO JUDGE ACTION ACCOMPLISHMENT OR INITIATION
Displays to provide feedback to the operators to confirm that the specific control functions have been initiated or completed.

11. POSITION OF CONTROLS TO JUDGE ACTION ACCOMPLISHMENT OR INITIATION
Position of control devices that provide feedback to the operators to confirm that proper control actions are initiated or completed.

12. ALARMS TO JUDGE ACTION ACCOMPLISHMENT OR INITIATION
Annunciators to provide feedback to the operators to confirm that proper control actions are initiated or completed.

13. OPERATOR AIDS TO JUDGE ACTION ACCOMPLISHMENT OR INITIATION
Operator aids to provide feedback to the operators to confirm that proper control actions are initiated or accomplished.

14. DISPLAY, CONTROL OR ALARM THAT IS CLASS 1E OR REGULATORY GUIDE 1.97 INSTRUMENT
Identification of those devices that are Class 1E or are provided by Class 1E or regulatory Guide 1.97 instruments.

18F.2.2 Guidelines For Selection

The following guidelines, developed from a research program on advanced control panel designs, were used to specify the candidate types of implementation devices for controls, displays and alarms.

(a) Fixed-Position Controls used for the following purposes shall be included in the inventory:
- Manual starting and resetting of safety systems,
- Manual starting of emergency backups,
- Mode switches for initiation of automation sequences.

(b) Divisional Visual Display Units (VDUs) used for the following purposes shall be included in the inventory:
- Individual controls of safety system components,
- Lineup displays of safety systems.

(c) Non-Divisional VDUs used for the following purposes shall be included in the inventory:
- Monitoring of non-safety systems and control of individual components of non-safety systems,
- Individual alarms

(d) Fixed-Position Alarms used for the following purposes shall be included in the inventory:
- Important plant-level and system-level alarms

(e) Fixed-Position Displays used for the following purposes shall be included in the inventory:
- Monitoring of important plant parameters

18F.2.3 Presentation of Results

The results of the operational analysis of each step of the ABWR EPGs and PRA important operator actions are summarized in Tables 18F-12.1 through 18F-12.3.

In the ABWR man-machine interface design, control, display and alarm indication functions are implemented through the use of divisional VDUs (referred to as "Div. VDUs"), non-divisional VDUs (referred to as "VDUs") and/or through the use of dedicated and fixed-position display devices. Refer to Subsection 18.4.2 for a description of the man-machine interface

standard design features. In Tables 18F-12.1 through 18F-12.3, as well as Tables 18F-1 through 18F-11, the particular candidate method of design implementation for each control, display and alarm function is indicated in brackets as part of each relevant table entry.

In all of these tables, entries are identified by bold-face type and capital letters when they are first identified in the analysis as being the primary method of executing a particular control, display or alarm function. An example is the indication of RPV water level as a critical parameter displayed on the fixed-position display panel in the main control, room.

(A) **RPV WATER LEVEL [FIXED-POSITION]**

Information given in the brackets indicates the type of implementing device. In order to minimize needless duplication of table entries, subsequent identification of the same design attribute is indicated in the tables with an underline and is not bold-faced nor capitalized. An example of indication of RPV water level in subsequent steps is:

(a) RPV water level [Fixed-Position]

Critical process parameters that are displayed on the fixed-position display panel are provided by Class 1E instruments via a non-safety-related display controller. These parameters are also available in the divisional VDUs and the non-divisional VDUs. Therefore, when a monitoring function is specified (entry conditions and usually the conditional statements of each step of the EPGs) and the primary source of the monitored parameter is identified for the first time as a parameter displayed on the fixed-position display panel, the corresponding divisional VDUs and non-divisional VDUs are also listed. However, to minimize unnecessary duplication in the table entries, subsequent listings of the same primary monitoring source (fixed display) will not have their corresponding displays on divisional and non-divisional VDUs identified. As an example, if average drywell pressure display is identified for the first time as shown below:

(A) AVERAGE DRYWELL TEMPERATURE [FIXED-POSITION]

(b) Average drywell temperature [Div. VDU]

(c) Average drywell temperature [VDU]

Subsequent identification of average drywell temperature as a fixed-position display will be as follows:

(a) Average drywell temperature [Fixed-Position]

To further reduce duplicate listings, table entries which are underlined will not have their instrumentation classification summarized in the Column 14 entries.

In certain columns of the tables, such as Column 7, "Controls to Execute Step", and Column 10, "Displays to Judge Action Accomplishment or Initiation", system controls or a system lineup display is specified as divisional VDUs or as non-divisional VDUs. In the case of Column 7, for

controls, all remote control equipment of a particular system can be controlled from the VDU. Also in Column 7, certain controls are specified as mode switches. An example is the RHR(A) Suppression Pool Cooling Mode Switch. Actuation of a system mode switch will initiate a predefined sequence of system level control,actions, such as aligning valves and starting pumps. In Column 10, a system lineup display typically represents a graphical mimic of the system similar to that presented in a system P & ID, where the position of valves, operating status of pumps and status of other components of the system are indicated. Key system and process parameters are also indicated.

Certain displays in these tables are indicated as being fixed displays. Examples of this type of display are (i) switch position indication of a standby liquid control pump control switch and (ii) mode switch selection indication of RHR shutdown cooling mode. For these examples, process parameters such as standby liquid control pump discharge pressure and RHR flow, respectively, provide sufficient information feedback on actions initiated by the operator. In addition, certain fixed displays such as recirculation pump trip status indication, main turbine stop valve and control valve status indication are not considered to be absolutely required because fixed-position alarms are provided which will present the same status information to the operators. These types of fixed-position displays are not indicated by bold-faced type nor capitalized and , hence, will not be included as part of this representative inventory of displays.

Throughout Tables 18F-1 through 18F-11, numerical values used in the EPGs and in Column 3 represent typical values. These values will be confirmed as part of the established HSI design implementation process, as defined in Appendix 18E, through the execution of plant-specific calculations and analytical methods and updated as necessary for the particular application. Other clarifications of the information presented in the tables are indicated by notes in the columns of the tables. Controls located outside of the main control room are indicated by an asterisk and a note at the end of Column 7.

18F.2.4 Important Operator Actions From the PRA

The following operator actions are considered to be important operator actions in the ABWR PRA (see Section 19D.7):

(1) Backup manual initiation of HPCF,
(2) Recovery of feedwater following a scram,
(3) Use of condensate injection following a scram with reactor depressurized,
(4) Control of reactor water level in an ATWS,
(5) Emergency depressurization of the reactor,
(6) Alignment and initiation of firewater for RPV injection with ECCS failure,
(7) Alignment and initiation of firewater for drywell spray,
(8) Initiation of wetwell spray using RHR,
(9) Isolation of water sources in an internal flooding,
(10) Initiation of standby RHR in event of failure of operating RHR during shutdown operations.

These actions have been determined to be a subset of the operator actions required to implement the EPGs and, therefore, no further analysis of them is required.

18F.2.5 Inventory Summaries

As discussed above, Tables 18F-12.1, 18F-12.2 and 18F-12.3 list typical inventories of the controls, displays and fixed-position alarms necessary to implement each step of the ABWR EPGs and certain PRA important operator actions. These tables are discussed in more detail in the following paragraphs.

18F.2.5.1 Typical Inventory of Controls

Table 18F-12.1 lists a typical inventory of controls used for execution of emergency operating procedures. These controls consist of fixed-position control devices and controls in divisional VDUs and non-divisional VDUs. In the analysis results presented in Tables 18F-1 through 18F-11, control devices that are required for execution of a particular EPG step or an important operator action are given in Column 7 in bold-face type and capital letters. These devices are summarized in Table 18F-12.1. In Table 18F-12.1, fixed-position controls that are Class 1E control devices are indicated by bold-face type and capital letters. Non-safety-related fixed-position control devices are indicated by lower case letters followed by a star character (★). All control devices located on divisional VDUs are provided by safety-related system controllers. Controls on the VDUs (driven by the process computer system) are provided by non-safety-related systems. In addition, non-safety-related control and display capability , as described in Subsection 18.4.2, are provided by VDUs that are independent of the process computer. These process computer-independent VDUs provide a backup control and display capability to the process computer-driven VDUs not specifically indicated in Tables 18F-1 through 18F-12.3.

18F.2.5 .2 Typical Inventory of Displays

Displays that are used for the implementation of the EPGs are identified in Tables 18F-1 through 18F-11 by bold-face type and capital letters and are summarized in Table 18F-12.2. In Table 18F-12.2, fixed-position displays provided by Class 1E instruments are similarly indicated by bold-face type and capital letters. Those that are provided by non-safety-related instruments are indicated by lower case letters and by a star character (★). A display parameter that is a Regulatory Guide 1.97 parameter is indicated by a double star character (★★) following the table entry.

18F.2.5.3 Typical Inventory of Alarms

The fixed-position alarms identified in Tables 18F-1 through 18F-11 are summarized in Table 18F-12.3. Fixed-position alarms provided by Class 1E instruments are similarly indicated by bold-face type and capital letters. Those that are provided by non-safety-related instruments are indicated by lower case letters with a star character (★) following the table entry.

18F.3 Minimum Inventory of Controls, Displays and Alarms

Tables 18F–22, 18F-23, and 18F-24 list the minimum inventories of controls, displays, and alarms, respectively, required to support operator actions to shut down the reactor, maintain adequate core cooling and remove core decay heat. These lists are based upon an analysis of the information and controls needed to satisfy the criteria that the main control room shall have sufficient fixed-position controls, displays and alarms during an emergency to achieve the successful completion of the above actions. In the remainder of this subsection, the specific rationale for defining the minimum sets listed in Tables 18F-22, 23 and 24 are discussed in the context of the EPG entry conditions and success paths.

18F.3.1 RPV Control EPG

The EOP entry conditions for RPV Control Section of the ABWR EPGs are any of the following:

(a) RPV water level low,
(b) RPV pressure high,
(c) Drywell pressure high,
(d) A condition which requires reactor scram and reactor power is above the APRM downscale trip value or cannot be determined.

The alarms and displays required for monitoring these conditions are summarized in Table 18F–13 and are considered a part of the minimum inventory set.

Table 18F–13
RPV Control Entry Conditions Monitoring

Entry Condition	Alarms	Displays
RPV water level low	RPV Water Level 3	RPV water level
RPV pressure high	RPV Pressure High-High	RPV pressure
Drywell pressure high	Drywell Pressure High-High	Drywell pressure
A condition which requires reactor scram, and reactor power is above 5% or cannot be determined, including:		
Neutron Flux high	Neutron Flux High-High	Reactor power (APRM)
Neutron monitoring system inoperative	NMS System Inop.	
CRD charging water pressure low	CRD Charging Pressure Low	
Rapid core flow decrease	Rapid Core Flow Decrease	
Main turbine trip	Main Turbine Trip	
Main generator trip	Main Generator Trip	
Main steam line radiation high	Main Steam Line Radiation High	Main steam line radiation
Reactor thermal power high		Reactor thermal power

For reactor water level control, a success path for core cooling consists of isolation of the reactor and systems connected to the RPV, initiation of standby AC power sources (the Class 1E diesel generators), and initiation of ECCS. The fixed-position controls, displays and alarms which provide for the initiation of control functions and confirmation that the actions taken were successful are summarized in Table 18F–14. These controls, displays and alarms are considered a part of the minimum inventory set.

Table 18F–14
RPV Water Level Control

EPG Success Path	Controls	Alarms	Displays
RC–1 Initiate manual scram	Manual Scram Initiation Switches A and B, Reactor Mode Switch		Scram Solenoids Power Status Lights (8); Reactor Power (SRNM).
RC/L–1, Initiate isolation	Main Steam Line Manual Isolation Switches (4, 1 per division)	RPV Level 1.5/Drywell Pressure High, Isolation Incomplete	Reactor Isolation Status; MSIV Position Status
RC/L–1, Initiate diesels	Diesel Generator Start Switches (3, 1 per division)		Emergency Diesel Generator Operating Status (3, 1 per division)
RC/L–1, Initiate isolation	Primary Containment Manual Isolation Switches (3, 1 per division)	RPV Level 3 Isolation Incomplete, RPV Level 2 Isolation Incomplete	Reactor Isolation Status.
RC/L–2 Initiate ECCS	RCIC System Initiation Switch, HPCF(B) System Initiation Switch, HPCF(C) System Initiation Switch, RHR(A) System Initiation Switch, RHR(B) System Initiation Switch, RHR(C) System Initiation Switch,	RPV Level 2, RPV Level 1.5, RPV Level 1	RCIC Flow, HPCF(B) Flow, HPCF(C) Flow, RHR(A) Flow, RHR(B) Flow, RHR(C) Flow.

For reactor power control, the success path is to initiate a manual scram. For reactor pressure control, successful pressure control is achieved by depressurizing the reactor. The fixed-position controls, displays and alarms required for manual scram and reactor depressurization are summarized in Table 18F-14 and are considered a part of the minimum inventory set.

Table 18F–15
RPV Power and Pressure Control

EPG Success Path	Controls	Alarms	Displays
RC–1 Initiate manual scram	Manual Scram Initiation Switches A and B, Reactor Mode Switch		Scram Solenoids Power Status Lights (8); Reactor Power (SRNM).
C2–1.3, Emergency RPV depressurization by ADS	Div. I Manual ADS Channel 1 Initiation Switch, Div. I Manual ADS Channel 2 Initiation Switch, Div. II Manual ADS Channel 1 Initiation Switch, Div. II Manual ADS Channel 2 Initiation Switch,		RPV pressure

18F.3.2 Primary Containment Control EPG

The EOP entry conditions for Primary Containment Control Section of the ABWR EPGs are any of the following:

(a) Suppression pool temperature high,
(b) Drywell temperature high,
(c) Drywell pressure high,
(d) Suppression pool water level high,
(e) Suppression pool water level low,
(f) Primary containment hydrogen concentration high.

The alarms and displays required for monitoring these conditions are summarized in Table 18F–15 and are considered a part of the minimum inventory set.

Table 18F–16
Primary Containment Control Entry Conditions Monitoring

Entry Condition	Alarms	Displays
Suppression pool average temperature	Suppression Pool Average Temperature High	Suppression pool average temperature
Drywell average temperature	Drywell Average Temperature High	Drywell average temperature
Drywell pressure	Drywell Pressure High	Drywell pressure
Suppression pool water level	Suppression Pool Water Level High/Low	Suppression pool water level
Drywell hydrogen concentration	Drywell Hydrogen Concentration High	Drywell hydrogen concentration (when monitors are in operation)
Wetwell hydrogen concentration	Wetwell Hydrogen Concentration High	Wetwell hydrogen concentration (when monitors are in operation)

For primary containment control, the success path consists of depressurizing the reactor and terminating injection flow into the containment when certain conditions exist as defined in the EPGs. The ultimate overpressure protection of the containment is provided by the rupture disks. The controls for depressurizing the reactor are given in Table 18F–15. The fixed displays for determining whether emergency reactor depressurization is required, and the fixed-position controls and displays required for terminating injection into the primary containment are summarized in Table 18F-17 and are considered a part of the minimum inventory set.

Table 18F–17
Primary Containment Control

EPG Success Path	Controls	Alarms	Displays
SP/T–3, emergency depressurization when pool temperature exceed limit.	(Refer to Table 18F–15)		Suppression pool average temperature, RPV pressure.
DW/T–3, emergency depressurization when drywell average temperature exceeds limit.	(Refer to Table 18F–15)		Drywell average temperature.
PC/P–3, emergency depressurization when wetwell pressure exceed limit.	(Refer to Table 18F–15)		Wetwell pressure, suppression pool water level.
SP/L–2, SP/L–3, emergency depressurization when suppression pool water level exceed limit.	(Refer to Table 18F–15)		Suppression pool water level, suppression pool average temperature, RPV pressure.
SP/L–3.3, terminate injection flow into the containment when containment water level cannot be maintained below limit.	Condensate pump standby mode initiation switches (3), reactor feedpump standby mode initiation switches (3)		Primary containment water level, wetwell pressure.
PC/H, PC/H–4, emergency depressurization when drywell or wetwell hydrogen concentration cannot be controlled below limits.	(Refer to Table 18F–15)		Wetwell hydrogen concentration, drywell hydrogen concentration.

The high pressure ECCS (RCIC, HPCF(B), HPCF(C)) have their suction valves automatically aligned to the suppression pool on high suppression pool water level. RHR can take suction only from the suppression pool. For these systems, no fixed–position controls for terminating injection flows into the containment are necessary.

18F.3.3 Secondary Containment Control EPG

The EOP entry conditions for Secondary Containment Control Section of the ABWR EPGs are any of the following:

(a) Reactor building differential pressure low,
(b) An area temperature above maximum normal temperature,
(c) A HVAC cooler differential temperature above the maximum differential temperature,
(d) A HVAC exhaust radiation level above the maximum normal radiation level,
(e) An area radiation above the maximum normal radiation level,
(f) A floor drain sump water level above the maximum normal water level.

The alarms required for monitoring these conditions are summarized in Table 18F–18 and are considered a part of the minimum inventory set.

Table 18F–18
Secondary Containment Control Entry Conditions Monitoring

Entry Condition	Alarms
Reactor building differential pressure low	Reactor Building ΔP Low
Area temperature above maximum normal temperature	Area Temperature High
HVAC cooler differential temperature above the maximum differential temperature	Area HVAC ΔT High
HVAC exhaust radiation level above the maximum normal radiation level	RB/HVAC Exhaust Radiation High
Area radiation above the maximum normal radiation level	Reactor Building Area Radiation High
Floor drain sump water level above the maximum normal water level	Reactor Building Floor Drain Sump Water Level High-High

For secondary containment control, the success path consists of depressurizing the reactor when certain conditions exist as defined in the EPGs. The controls for depressurizing the reactor are given in Table 18F–15. The displays for determining whether emergency reactor depressurization is required are summarized in Table 18F-17 and are considered a part of the minimum inventory set.

Table 18F–19
Secondary Containment Control

EPG Success Path	Controls	Alarms	Displays
SC/T–4.2, emergency depressurization when an area temperature exceeds its maximum safe operating temperature in more than one area.	(Refer to Table 18F–15)	Area Temperature High-High	
SC/R–2.2, emergency depressurization when area radiation level exceeds its maximum safe operating level in more than one area.	(Refer to Table 18F–15)	Reactor Building Area Radiation High–High	

18F.3.4 Radioactivity Release Control EPG

The EOP entry conditions for Secondary Containment Control Section of the ABWR EPGs is offsite radioactivity release rate above the offsite release rate which requires a declaration of an Alert status. The offsite release rate will be based upon calculations in accordance with the Offsite Dose Calculation Manual, results of sampling analysis, or portable survey instruments. No specific fixed-position alarms and displays will directly indicate the entry condition. However, fixed-position alarms Stack Radioactivity High and RCW Radioactivity High will prompt the operator to initiate action for sampling analysis and dispatch survey team to the plant boundary. These two fixed-position alarms are considered a part of the minimum inventory set.

Table 18F–20
Radioactivity Release Control Entry Conditions Monitoring

Entry Condition	Alarms
Offsite release rate above level for Alert status.	Stack Radioactivity High, RCW Radioactivity High

The success path for radioactivity release control is to isolate primary systems and depressurize the reactor. The fixed-position devices to achieve these actions are given in Table 18F–15.

18F.3.5 RPV Flooding Contingency

When RPV water level cannot be determined or when water level instruments cannot be relied upon to provide indication of adequate core cooling, RPV flooding is required, as specified in the ABWR EPGs. The RPV Flooding Contingency provides strategies for flooding the RPV. RPV water level must be continuously monitored. The EOPs provide specific criteria for determination of validity of indicated water level instruments. A fixed-position alarm, Indicated RPV Water Level Abnormal, will alert the operator when conditions exist which indicates that the displayed RPV water level was not reliable. This alarm is considered part of the minimum set of fixed-position alarms.

A success path for RPV flooding is for the operator to initiate flooding using HPCF(B) or HPCF(C), bypassing the Level 8 HPCF shutoff interlock so that HPCF can continued to be used for flooding the RPV above level 8. The fixed-position controls and displays necessary for flooding the RPV with the reactor shutdown are given in Table 18F-21 and are included as part of the minimum inventory set.

Table 18F–21
RPV Flooding Contingency

EPG Success Path	Controls	Alarms	Displays
C4–3.1: Initiate HPCF to inject into the RPV until at least 6 SRVs are open, RPV pressure is not increasing and is 3.27 kg/cm^2 g or more above wetwell pressure, bypassing Level 8 interlock.	HPCF(B) System Initiation Switch, HPCF(C) System Initiation Switch, Level 8 HPCF(B) logic bypass (in system cabinet), Level 8 HPCF(C) logic bypass (in system cabinet),	Indicated RPV Water Level Abnormal	RPV pressure, Wetwell pressure, SRV position indication.

18F.3.6. Primary Containment Flooding Contingency

For certain postulated LOCAs, adequate core cooling can only be maintained when the primary containment is flooded to an elevation above the top of the active fuel. The minimum controls, displays, and alarms necessary for flooding the containment, and terminating injection flow into the containment, are included in Table 18F-14 and Table 18F–17, respectively.

18F.3.7 Regulatory Guide 1.97 Parameters

Fixed–position displays that are not specifically required by the above analysis of minimum inventory based on defined success paths, but are required by Regulatory Guide 1.97, are included as part of the minimum displays. These are Condensate Storage Tank Water Level and SLC Pump Discharge Pressure. All parameters in the minimum display inventory (Table 18F-23) are Regulatory Guide 1.97 parameters except the SRV Position Status indications and Scram Solenoids Power Status indications. One Regulatory Guide 1.97 requirement for reactor scram status indication is provided by an alarm, Control Rod Not Inserted To/Beyond MSBWP.

TABLE 18F-22

MINIMUM INVENTORY OF CONTROLS

NO.	FIXED POSITION
1	MANUAL SCRAM INITIATION SW(A),
2	MANUAL SCRAM INITIATION SW(B),
3	REACTOR MODE SW
4	DIV. I MAIN STEAM LINE MANUAL ISOLATION SW
5	DIV. II MAIN STEAM LINE MANUAL ISOLATION SW
6	DIV. III MAIN STEAM LINE MANUAL ISOLATION SW
7	DIV. IV MAIN STEAM LINE MANUAL ISOLATION SW
8	PRIMARY CONTAINMENT DIV. I MANUAL ISOLATION SW,
9	PRIMARY CONTAINMENT DIV. II MANUAL ISOLATION SW,
10	PRIMARY CONTAINMENT DIV. III MANUAL ISOLATION SW,
11	RCIC INITIATION SW
12	HPCF (B) INITIATION SW
13	HPCF (C) INITIATION SW
14	RHR (A) INITIATION SW
15	RHR (B) INITIATION SW
16	RHR (C) INITIATION SW
17	DG(A) START SW,
18	DG(B) START SW,
19	DG(C) START SW,
20	LEVEL 8 HPCF(B) SHUTOFF LOGIC BYPASS (SYSTEM CABINET IN BACK PANEL)
21	LEVEL 8 HPCF(C) SHUTOFF LOGIC BYPASS (SYSTEM CABINET IN BACK PANEL)

NO.	FIXED POSITION
22	DIV I MANUAL ADS CHANNEL 1 INITIATION SW,
23	DIV I MANUAL ADS CHANNEL 2 INITIATION SW,
24	DIV II MANUAL ADS CHANNEL 1 INITIATION SW,
25	DIV II ADS MANUAL ADS CHANNEL 2 INITIATION SW,
26	CONDENSATE PUMP (A) STANDBY MODE INITIATION SWITCH
26	CONDENSATE PUMP (B) STANDBY MODE INITIATION SWITCH
27	CONDENSATE PUMP (C) STANDBY MODE INITIATION SWITCH
28	REACTOR FEEDPUMP (A) STANDBY MODE INITIATION SWITCH
29	REACTOR FEEDPUMP (B) STANDBY MODE INITIATION SWITCH
30	REACTOR FEEDPUMP (C) STANDBY MODE INITIATION SWITCH

TABLE 18F-23

MINIMUM INVENTORY OF DISPLAYS

NO.	FIXED POSITION
1	RPV WATER LEVEL ★★ [1]
2	WETWELL PRESSURE ★★,
3	SUPPRESSION POOL BULK AVERAGE TEMPERATURE ★★,
4	HPCF(B) FLOW ★★,
5	HPCF(C) FLOW ★★,
6	RPV PRESSURE ★★,
7	DRYWELL PRESSURE ★★,
8	REACTOR POWER LEVEL, (NEUTRON FLUX, APRM) ★★,
9	REACTOR POWER LEVEL (SRNM) ★★,
10	REACTOR THERMAL POWER ★★,
11	MSIV POSITION STATUS (INBOARD AND OUTBOARD VALVES) ★★
12	MAIN STEAM LINE RADIATION ★★,
13	SCRAM SOLENOIDS POWER STATUS LIGHTS (8)
14	RPV ISOLATION STATUS ★★
15	RCIC FLOW ★★,
16	RHR(A) FLOW ★★,
17	RHR(B) FLOW ★★,
18	RHR(C) FLOW ★★,
19	EMERGENCY DIESEL GENERATOR (A) OPERATING STATUS ★★,
20	EMERGENCY DIESEL GENERATOR (B) OPERATING STATUS ★★,
21	EMERGENCY DIESEL GENERATOR (C) OPERATING STATUS ★★,

NO.	FIXED POSITION
22	PRIMARY CONTAINMENT WATER LEVEL ★★,
23	CONDENSATE STORAGE TANK WATER LEVEL ★★,
24	SLC PUMP(A) DISCHARGE PRESSURE ★★
25	SLC PUMP(B) DISCHARGE PRESSURE ★★
26	SUPPRESSION POOL LEVEL ★★,
27	AVERAGE DRYWELL TEMPERATURE ★★,
28	WETWELL HYDROGEN CONCENTRATION LEVEL ★★,
29	DRYWELL HYDROGEN CONCENTRATION LEVEL ★★,
30	DRYWELL OXYGEN CONCENTRATION ★★
31	WETWELL OXYGEN CONCENTRATION ★★
32	Main Stack radiation level ★★,
33	DRYWELL RADIATION LEVEL ★★
34	WETWELL RADIATION LEVEL ★★
35	SRV POSITION STATUS (6)

1 ★★ denotes Regulatory Guide 1.97 parameters.

TABLE 18F-24

MINIMUM INVENTORY OF ALARMS

NO.	FIXED POSITION
1	INDICATED RPV WATER LEVEL ABNORMAL
2	RPV WATER LEVEL 3,
3	RPV PRESSURE HIGH-HIGH
4	DRYWELL PRESSURE HIGH-HIGH
5	NEUTRON FLUX HIGH-HIGH
6	NEUTRON MONITORING SYSTEM INOP
7	CRD CHARGING WATER PRESSURE LOW,
8	RAPID CORE FLOW DECREASE,
9	MAIN TURBINE TRIP
10	MAIN GENERATOR TRIP
11	MAIN STEAM LINE RADIATION HIGH,
12	RPV LEVEL 3 ISOLATION INCOMPLETE,
13	RPV LEVEL 2 ISOLATION INCOMPLETE,
14	RPV LEVEL 1.5/DRYWELL PRESSURE HIGH ISOLATION INCOMPLETE,
15	RPV WATER LEVEL 2,
16	RPV WATER LEVEL 1.5,
17	RPV WATER LEVEL 1,
18	CONTROL ROD SCRAM STATUS
19	SUPPRESSION POOL BULK AVERAGE TEMPERATURE HIGH,
20	DRYWELL AVERAGE TEMPERATURE HIGH,

NO.	FIXED POSITION
21	SUPPRESSION POOL WATER LEVEL HIGH/LOW,
22	CAMS H2/O2 LEVEL HIGH,
23	REACTOR BUILDING ΔP LOW
24	AREA TEMPERATURE HIGH
25	AREA HVAC ΔT HIGH
26	RBHVAC EXHAUST RADIATION HIGH
27	REACTOR BUILDING AREA RADIATION HIGH
28	REACTOR BUILDING FLOOR DRAIN SUMP WATER LEVEL HIGH-HIGH
29	STACK RADIOACTIVITY HIGH
30	RCW RADIOACTIVITY HIGH